

EIS PROFILE

McKenzie Andre

Years in EIS: 2001-2003

Age: 31

Hometown: Brooklyn, NY

Assignment: Tracks the spread of tuberculosis in high-risk populations. After September 11, he was part of the first wave of EIS officers sent to New York City to support the NYC Public Health Department.

Education: Yale University (B.S., 1992); Howard University (M.D., 1998).

Where He Is Today: Andre lives in Atlanta, where he is serving as an EIS officer.

2000



New York-Born Disease Detective Returns Home to Assist Local Public Health Officials in Wake of Terrorist Attack

On September 11, Dr. McKenzie Andre was like all Americans – stunned by the events taking place in New York, Washington and Pennsylvania. But, for Andre, who recently finished his residency training, and at the time was in his third month as a CDC disease detective in Atlanta, the events in New York hit him particularly hard since he grew up in Brooklyn and all his immediate family and friends still lived there.

When the director of CDC's Epidemic Intelligence Service (EIS) sent out an e-mail that 30 officers were needed for the first wave heading to New York, Andre immediately volunteered.

"I definitely wanted to be there. New York is home – I felt like I should be there," he recalled, adding, "As part of our EIS training, we participated in bioterrorism preparedness practices and scenarios – but I don't think anyone thought this would happen."

Two days later, he flew to New York on a Royal Australian Air Force C130J military aircraft from Dobbins Air Force Base in Georgia.

Once on the ground, he and the other disease detectives were bussed to the New York City Public Health Department Laboratory – the staging area for the public health response. Andre and the other EIS officers were assigned to conduct surveillance at 15 hospitals around the city. A CDC EIS officer was at each hospital 24 hours a day. Stationed at Bellvue Hospital Center, Andre was well prepared to work in a New York emergency room since his residency was at St. Luke's-Roosevelt Hospital Center in New York City.

"We kept track of every single person who came into the hospital. We were doing syndromic surveillance – monitoring for a pattern of symptoms or injuries in the aftermath of the attack that could indicate a possible bioterrorism event," said Andre, who worked 15-hour days in the first days of the crisis. "We were trying to answer questions like, 'Are hospitals being overrun?' 'Are there a lot of specific types of injuries or symptoms?'" The input was gathered daily and provided to New York public health officials for analysis. The information gave officials an accurate picture of the city's

health needs in the critical days after the attacks, allowing the public health teams to focus on the rescue and recovery effort.

"Part of what we were responding to was public fears. If you can give people the most accurate information, it goes a long way," Andre said, noting that before people were assigned onsite, the public health department relied on busy hospital staff to track incoming patients and were only capturing 40 percent of the people being admitted.

"Our team was able to capture 95 or 96 percent," he said.

A pivotal moment came when Andre went down to Ground Zero to fit firefighters and construction workers with respirators. Information gathered by EIS officers in the hospitals had demonstrated that first responders were suffering upper-respiratory symptoms. Fitting the masks correctly with the specific type of respirator was not simple but was essential to protect the people working at the site. The type of mask depended on the level of exposure or where the person was working. Once the masks were on, Andre physically tested each one to make sure they were sealed properly.

"I was standing in front of 20 stories of rubble. There were about six construction workers working in the basement in a nearby building and they didn't want to come out. So I went in and I tested them with a flashlight. It was dark in there. They were working 48 and 72 hours straight – they wouldn't stop," recalled Andre. "Their spirit really showed. It makes me feel good that we have this ability to respond. You hope you don't have to draw on it but at the same time you're glad to know it's there. I was never more proud to be from New York than I was at that moment."

Andre stayed on in New York for 15 days, and then returned again to New York on October 30, the day after a 61-year-old Bronx hospital worker was diagnosed with inhalational anthrax. He assisted local public health and law enforcement agencies as they retraced the woman's steps for the last two weeks of her life.

"We talked to her doctors, her neighbors and to her co-workers. We found out where she had lunch. We found out her train route. We got her metro card and learned what time she got on certain trains and traced her path." The investigation has not resulted in a definitive answer to how the woman was exposed and later died, but it did rule out how she got it – her apartment building and workplace were all clean.

"I never realized before what a dedicated group of people I work with," Andre said. "We really challenged each other."

He added that although public health work is not glamorous, it is work that has to be done. "It's my job. The same way the guys who were driving the truck to take away the debris, I felt like you have something to offer; you hope that it makes a difference."

Now, Andre is back at his regular EIS assignment – tuberculosis control in high-risk populations such as HIV-positive people, and homeless and immigrant groups. He looks forward to a career that will combine his clinical work with public health. As for his recent EIS experiences, Andre believes that they will make him a better doctor. He knew he wanted to join CDC's EIS program his first year as a medical student.

"I love medicine. I think of myself as a physician first but I wanted to understand a little more about what happens in communities. As September 11 showed, we don't live

in a vacuum. The idea is to take the lessons you learned and bring that back with you to your patient interactions."

Andre is one of 140 EIS officers learning epidemiology at CDC through hands-on experience.

"It's a group of people who are dedicated to learning and having that kind of experience. And a lot of the people who work at state and local health departments are CDC-affiliated or EIS graduates. While I'm at CDC, I want to learn as much as I can about working in the public-health realm," Andre said.

EIS PROFILE

Rachel Nonkin Avchen

Years in EIS: 2000-2002

Age: 29

Hometown: Miami, FL

2000



Assignment: Avchen is currently investigating the consequences of untreated jaundice in infants, which can lead to kernicterus, a type of brain damage. She also investigated the possibility of increased rates of blindness due to retinopathy of prematurity among infants in California and acted as a team leader for surveillance of West Nile encephalitis in Staten Island, NY.

Education: Emory University (B.A., 1993). University of Miami (M.S., 1996 and Ph.D., 1999).

Where She Is Today: A resident of Atlanta, Avchen is completing her second year in the EIS, assigned to CDC's newest center, the National Center on Birth Defects and Developmental Disabilities.

EIS: Beyond Infectious Disease

When most people think of CDC's Epidemic Intelligence Service, infections like HIV/AIDS, Ebola virus, and hantavirus immediately come to mind. Those people are not wrong, they just don't have the whole story. Ask Rachel Avchen, a CDC disease detective who investigates ways to prevent developmental disabilities among children.

As a recent graduate with a Ph.D. in applied developmental psychology, Avchen concluded that one way to use her degree to its greatest advantage would be as part of CDC's elite cadre of disease detectives who help to protect the world's health and safety by preventing and controlling diseases and injuries.

"As an EIS Officer, I can impact society through public health, and translate the research that I do into real life situations," says Avchen.

While the EIS is known for the eradication of small pox from the planet, and investigations of outbreaks such as West Nile encephalitis and Ebola virus, Avchen would like people to know that the EIS focuses on more than infectious disease, but also birth defects and developmental disabilities, chronic disease, environmental hazards and injuries.

Recently, Avchen found herself on the frontlines of defense in assisting a community in California. A non-profit organization that serves children with visual impairments reported finding a greater number of blind infants due to retinopathy of prematurity, a condition that can occur in premature babies. Retinopathy of prematurity is caused by the detachment of the retina in the eye. Although the condition can often be corrected, it can lead to blindness if not caught early enough.

Avchen flew to California to investigate whether the elevated numbers in retinopathy of prematurity actually represented an increase in this community. After analyzing the files against an operational case definition, she and her colleagues concluded that there weren't enough cases that actually met the criteria to constitute an increase. Avchen and her co-team leader, EIS Officer Sharon Durosseau, recommended ways the organization could better track cases in order to determine the true number of retinopathy of prematurity cases themselves.

More recently, Avchen loaned her expertise to an investigation of kernicterus in full-term infants, a preventable disease that causes brain damage and that starts with severe jaundice. Members of a non-profit organization led by parents of children with kernicterus were concerned about the number of children developing the disease.

Jaundice results from too much bilirubin, a part of the red blood cell that is left after the cell dies. Elevated levels of bilirubin can cause a baby to look yellow or orange. Severe and untreated jaundice can cause kernicterus, a type of brain damage that can lead to athetoid cerebral palsy, hearing loss, and vision and dental problems. It is easy to prevent kernicterus by placing severely jaundiced babies under a special lamp.

"For a child with kernicterus, a simple thing like writing is difficult, because mentally the child may be saying 'I want to write my name', but physically the child cannot get his hand down to the paper," Avchen says. "Stories like this make kernicterus real." The parents concerned about kernicterus were anxious for answers and Avchen was under pressure to move quickly.

Avchen and her colleagues worked expediently to provide information about kernicterus to parents and health care professionals.

In June 2001, Avchen published an article in CDC's Morbidity and Mortality Weekly Report.

"We were able to quickly inform public health officials across the country about cases of kernicterus in otherwise healthy term infants with jaundice," Avchen says.

Avchen is now hoping to pursue surveillance of kernicterus to determine the magnitude of the problem.

After EIS, Avchen plans to continue working in the public health arena.

"I think it is important not only to analyze data, but to apply that knowledge to real-life circumstances."

EIS PROFILE

Wanda Barfield

Years in EIS: 2000-2002

Age: 38

Hometown: Charleston, SC

2000



Assignment: Barfield joined the EIS in 2000 and was assigned to CDC's pregnancy and infant health branch. Her first assignment was to evaluate the process by which the Oregon Health Department handled requests for pre-adoption birth records to adult adoptees across the state, as a result of passage of controversial legislation.

Education: University of California at Irvine (B.S., 1985); Harvard University (M.D.; M.P.H., 1990).

Where She Is Today: A resident of Atlanta, Barfield is completing her first year as an EIS officer and looks forward to a public health career at CDC that will allow her to continue to link clinical issues in neonatal care with policy issues.

Studying the Effects of a Controversial Adoption-records Policy

Wanda Barfield, a neonatologist who had worked for the Army before entering the EIS in 2000, never imagined that she would be testing her epidemiological skills to evaluate how a public health department responded to a policy, rather than studying the effects of a disease on a population.

Barfield had spent the previous four years working at a Neonatal Intensive Care Unit in Tacoma, Washington, a facility that cares for approximately 30 seriously ill newborns a day from military families based in the Pacific Northwest. She transferred from her military assignment into the EIS in 2000.

In her second month as an EIS officer, Barfield and another EIS officer, Julia Rhodes (EIS '00), were called to Oregon to analyze the Oregon Department of Human Services' handling of requests from adoptees, who had been given permission to obtain their previously sealed pre-adoption birth records. The controversial ballot measure, which voters had passed in November 1998, had not been implemented until June of 2000 because of opposition from birth mothers. The result for the health department was a backlog of 4,700 requests to be processed and filled.

"Adoptees would be able to look at the name and other demographic information of their birth parents," said Barfield. "There was also the expectation that they would be able to obtain medical information. But generally, birth certificates provide just basic demographic information."

"Our challenge was to find out how this legislation affected the health department, particularly in terms of resources, and also to determine if the information that the adoptees received was useful to them," Barfield said.

For a three-week period, Barfield and Rhodes conducted their investigation, and, according to Barfield, the health department handled a challenging situation with professionalism and with a commitment to accuracy.

"They had to implement this mandate, while simultaneously handling responses that came from opponents and advocates of the legislation. The health department had to interact with the public a lot. They remained objective and really took on a leadership role," Barfield said, noting that an added challenge was ensuring the accuracy of archived birth records that dated back to the 1920s, with many of the certificates having incomplete information such as no father's name listed.

Late in the process, Oregon's governor had approved the use of a contact preference form, which gave birth parents the opportunity to indicate if they preferred being contacted by adoptees and in what manner and to provide their medical information anonymously.

"One of our recommendations for other states considering this sort of legislation is to create a way that birth parents could state their preference for contact prior to the release of forms," Barfield said. "Another option is using existing adoption registries. These registries allow birth parents to include medical or other information as part of the background provided to the adopting parent.

"Other states can learn a lot from the Oregon experience," concluded Barfield, who noted that Washington state is considering similar legislation. "Oregon is already improving its process. They're thinking of ways to reorganize archived adoption records to allow better accessibility."

This unusual first assignment gave Barfield a chance to combine her interest in epidemiology with public policy.

Barfield's interest in public health began while in medical school at Harvard University, where she also earned a master's degree in public health. She then worked as a pediatric resident at Walter Reed Army Medical Center and completed a fellowship in perinatal medicine at Children's Hospital in Boston. From there, she entered the Army, most recently serving as director of the Neonatal Intensive Care Unit at Madigan Army Medical Center in Washington.

As an EIS officer, Barfield is most interested in continuing her work in epidemiology, and specifically, studying the underlying causes of fetal and infant mortality. Called perinatal mortality, this under-reported area refers to a combination of infant deaths that occur at less than seven days of age, or stillbirths that occur late in pregnancy. Out of almost four million live births in 1998, over 27,000 resulted in perinatal deaths.

"This is an important area that hasn't been looked at very rigorously in the United States, yet it's an area where intervention could have a major impact," Barfield explained. She noted that linking maternal and child health disciplines more closely together throughout the process could lead to better understanding of the root causes of perinatal deaths and to better preventive strategies. She also believes that policy plays an important role in the public health arena.

"With all the advances we have in medical care, their effectiveness is only as good as the access people have to them," Barfield said. She added that there are several low-tech and inexpensive ways to reduce infant deaths. "Steps people can take include promoting maternal and women's health, following good nutrition, ensuring everyone has access to good healthcare, obtaining immunizations for their children and placing

babies on their backs to sleep. These examples are very straightforward measures that can be implemented relatively easily," she said.

Barfield is tackling these issues by working closely with world-renowned maternal and child health experts, including those working alongside her at CDC's pregnancy and infant health program. She counts among her mentors Drs. Kay Tomashek (EIS '97), Solomon Iyasu (EIS '89) and Branch Chief Hani Atrash (EIS '79).

She is looking forward to continuing her affiliation with CDC once her EIS assignment ends in 2002.

"I see the EIS experience as the perfect opportunity to link a lot of the clinical issues that I've learned as a practicing physician, with the broader issues of healthcare access and social policy. I am excited by the opportunity to learn the tools of epidemiology in order to push those things forward," Barfield concluded.

EIS PROFILE

Sandra I. Berrios-Torres

Years in EIS: 2000-2002

Age: 36

Hometown: Bayamón, Puerto Rico

Assignment: Studies injuries among U.S. Hispanics and works on injury surveillance in Latin America. On September 11, flew to New York City to assist in injury surveillance at hospital emergency rooms and Ground Zero. Later participated in syndromic surveillance during the World Series in Arizona.

Education: Emory University (B.S. Biology, 1987); Stanford University School of Medicine (M.D., 1992).

Where She Is Today: Berrios-Torres lives in Atlanta, where she is serving as an EIS officer.

2000



CDC Disease Detective Helps Set Up Surveillance System in New York in Critical Hours Following September 11 Attacks

As an orthopedic surgeon, Dr. Sandra I. Berrios-Torres has dealt with plenty of emergency situations. But, the Puerto Rican native and current CDC disease detective found her skills as a public health professional tested on September 11 when she was one of the first two EIS officers, or disease detectives, deployed to New York City.

On the afternoon of September 11, 2001 the CDC team departed for New York City, in the only non-military aircraft in U.S. airspace at that time. There was a moment of tension when they approached the Washington, D.C. area.

"We could see two black dots in the distance heading toward us. We were relieved to finally realize they were fighter jets escorting us over the Washington, D.C. airspace," Berrios-Torres recalled.

Once in New York, Berrios-Torres and her colleagues joined the New York City Department of Health (NYCDOH) teams deployed to area hospitals to assess injuries treated in the ER in the hours immediately following the attacks. Working without benefit of phones, fax or Internet, the teams spent all night reviewing hundreds of charts and performing data entry to generate a summary report for the New York City Health Commissioner and Mayor to use in the morning press conference.

On Friday, September 14th, her assignment changed. Disaster Medical Assistance Teams (DMAT) had arrived to provide care at Ground Zero. For the next 28 days, Berrios-Torres and fellow EIS field officer Michael Phillips (EIS '00) monitored rescue workers for injuries and illness at the site.

That same afternoon, 34 EIS officers, the largest deployment ever at CDC, arrived in New York City. They assisted in syndromic surveillance – monitoring for symptoms that could indicate a bioterrorism event – at multiple area hospital emergency rooms around the clock. By that evening, the Rescue Worker Injury/Illness Surveillance System was established at four area emergency departments and at Ground Zero. Berrios-Torres worked with the health department team every morning collecting the forms at Ground Zero and returning to the Health Department to assist in data entry and in generating a daily summary report.

The daily, 17-page report was filled with charts of data about the type of visits to these facilities. The information reported was current up to midnight of the previous day. Berrios-Torres explained that the timely collection and reporting of the data helped the health department guide public health interventions for ensuring continued rescue-worker safety, including the distribution and proper use of personal protective equipment such as respirator masks and providing medical equipment to facilitate diagnosis of eye injuries. Information provided by the team helped create a map showing the location of DMAT facilities so that fire, police and construction workers would know where to access health care at the site.

"It's just incredible that we got things done as efficiently and as effectively as we did, considering communication was virtually impossible without phones, fax, or Internet. The commutes were also a challenge, particularly for NYCDOH personnel and those EIS officers stationed in remote emergency departments," Berrios-Torres said.

She added that her experience as a surgeon helped. "I'm familiar with being in a crisis situation, focusing on the task at hand and putting everything else aside," she said.

Berrios-Torres, who remained in New York for 32 days, said the Rescue Worker Injury and Illness Surveillance System was probably the first system of this type to be established prospectively in a disaster situation. She applauded the strong collaborative spirit among the NYCDOH and CDC personnel.

"Teamwork was crucial – that's been one of the most rewarding aspects. Even though I departed on October 13, we continue to work as a team long distance."

Berrios-Torres' surveillance work didn't end in New York. She was deployed to Phoenix, Arizona, on October 26 with fellow EIS officer Maryam Haddad (EIS '01) to assist the Arizona Department of Health Services in establishing syndromic surveillance at hospital emergency departments before the start of the World Series.

"The goal was to implement early syndromic disease detection that could be indicative of a bioterrorist event and in this way facilitate a rapid public health response," she said. The surveillance continued for two weeks after the last game of the World Series.

Soon, Berrios-Torres will use her experience in sports medicine and injury surveillance when she works with the Utah Department of Health, at the XIX Olympic Winter Games in Salt Lake City, where she will assist in injury surveillance.

"We will assess injuries among spectators, athletes and other members of the Olympic family at the Winter Olympics," She said. "The data collected will be analyzed and reported continually to facilitate public health intervention. Lessons learned can be applied to future Winter Olympic events as well as other mass gatherings in winter settings," she said.

Berrios-Torres looks forward to a busy and productive final year as an EIS officer. Her current EIS assignment focuses on a continued collaboration with the NYCDOH on analysis of the Rescue Worker Injury/Illness Surveillance System and studies on injury among United States Hispanics.

"Injuries account for the top three leading causes of death among Hispanics between the ages of 15 and 24," Berrios-Torres said, and is an "under-recognized public health problem."

Berrios-Torres' injury work has extended into Latin America, where in collaboration with CDC Foundation International Fellow Carmen Clavel-Arcas, she helped establish an injury surveillance system in Nicaragua with. It is the first in the Americas to use World Health Organization Guidelines for Injury Surveillance in Less Resourced Environments. The system has since expanded to El Salvador.

Even with her busy schedule, Berrios-Torres will never forget her 32 days serving on the front lines of public health in New York. It was there that she experienced first-hand the impact public health can have on a community.

"The work we did and the timely information we provided to local, state and federal stakeholders was useful not only at the time of the crisis, but also has allowed us to learn valuable lessons that we can apply in future settings," she said.

EIS PROFILE

Kevin Griffith

Years in EIS: 2001-2003

Age: 33

Hometown: Indianapolis, Indiana

Assignment: Investigates disease outbreaks as state EIS officer for the Connecticut Department of Public Health. After September 11, supported ER surveillance in New York City and investigated inhalational anthrax case in Connecticut.

Education: DePauw University (B.S. Psychology, 1990); Indiana University School of Medicine (M.D., 1994); Harvard School of Public Health (M.P.H., 2000).

Where He Is Today: Griffith lives in Hartford, Conn., where he is serving as an EIS officer.

2000



Connecticut-based EIS Officer Hot on the Trail of Anthrax

Dr. Kevin Griffith, a CDC Epidemic Intelligence Service (EIS) officer on assignment at the Connecticut Department of Public Health, never thought he would be adding bioterrorism surveillance and anthrax detective work to his public health skill sets.

Griffith, a 33-year-old MD with an interest in environmental issues, had already built up an impressive record of medical service to underserved populations before coming to CDC. During medical school and residency, he volunteered as a doctor on the Navajo and Apache reservations in New Mexico and served on medical missions to Ecuador and Guatemala.

After the September 11 terrorism attacks, Griffith answered the CDC's call for volunteers to travel to New York in the largest EIS deployment ever.

"I had never been to New York City before. Coming into the city, seeing the smoke hovering over Manhattan, was a surreal experience," Griffith said. "As we got closer to the public health operations center, all the streets were blocked off from traffic and police were on every corner."

He spent the next three weeks monitoring for symptoms of bioterrorism in the emergency room of Brooklyn's Lutheran Medical Center. One day after his 12-hour shift, Griffith took a one-hour train to Manhattan to deliver his surveillance data to the public health operations center. It was the Monday after the attacks, the first day many commuters returned to work in Manhattan.

"It was about 8 a.m. and I was coming back from Brooklyn. While making a transfer, I came around the corner inside the subway station and saw a mass of people coming toward me. I remember they were being led by a police officer who was carrying a young girl who had been knocked over. There had been a bomb threat," recalled Griffith, whose communication skills as a family doctor helped him to calm some of the people he encountered.

"People were very panicked – they couldn't deal with the added stress. It's an example of how far the population had been pushed," he said.

Griffith's New York assignment was completed on September 29 and, after a quick CDC debriefing in Atlanta, he returned to Hartford. Three days later, the first anthrax case was reported in Florida. Connecticut and other state health departments across the country were immediately bombarded with public inquiries about anthrax.

"We fielded hundreds of calls in the first couple of days. Being a physician, I was asked to respond to physician calls," Griffith said. "Doctors were inundated with people wanting nasal swabs and they wanted advice on how to screen people correctly."

When inhalational anthrax was confirmed in a 94-year-old woman from Oxford, Connecticut on November 19, Griffith was the first public health official deployed to the hospital. He spoke to her physician and reviewed her medical chart, but was unable to interview the woman since she was already in intensive care. Instead, Griffith and a local FBI agent questioned the woman's niece and other close contacts. The woman died on November 21.

"We were trying to reconstruct the last 60 days of her life before she developed the illness. We categorized her exposures by whether they were mail or non-mail related. We looked for ways she could have been exposed to anthrax, but we couldn't find any evidence that she received any of those letters. So, our investigation switched from looking for a direct source to a cross-contaminated source," Griffith said.

Unlike the anthrax case in New York that involved a Bronx woman who worked at a hospital and traveled by subway, the Connecticut woman spent most of her time at home.

The Connecticut Department of Public Health led the investigation with support from EIS and other CDC staff – forming teams to focus on environmental sampling, epidemiologic investigation, surveillance, post-exposure prophylaxis and clinical case follow up. More than 24 CDC and 30 Connecticut DPH people took part in the investigation.

Team members quickly became experts on U.S. Postal Service operations and processes. They found traces of anthrax contamination at the regional postal facility that processed the woman's mail. Though four machines were contaminated with anthrax, there was not evidence of the widespread contamination that had been seen in facilities in New Jersey and Washington, D.C.

Griffith supported the mail investigation by calling bulk-mailing organizations that sent mail through New Jersey to Connecticut from October 9 to 17 to look for evidence of cross-contaminated bulk mail sent to the woman's home or zip code.

"In collaboration with U.S. Postal Service and the Postal Inspectors, we learned of a letter to a nearby address that had passed through the same machine in New Jersey approximately 20 seconds after the Leahy letter was processed," Griffith recalled, noting that investigators used trace forward analysis that allowed them to know the timing of the letter by the sequential numbering of the letters as they were processed.

Since the team also had initiated widespread surveillance of death certificates, and veterinarian, laboratory and hospital admissions records, they quickly were able to

compare data. By coincidence, the address where the contaminated letter was sent was next door to one of the death certificates.

"According to our surveillance records, a person next door to where the letter was sent had been found dead in his home the same week our patient developed anthrax. There were no autopsy records and no family to talk to about the death. We contacted the health commissioner, governor and FBI and decided to go to the home where the letter was received while the medical examiner performed an autopsy that night," said Griffith, who was part of the team that made the midnight trip to the residence.

After waking the recipients of the letter, the team swabbed mailboxes and returned the following day for the letter, which tested positive for anthrax.

"Fortunately, the people were not infected and the autopsy turned up negative for anthrax," said Griffith.

In addition, Griffith coordinated post-exposure prophylaxis for the 16 local residents who had contact with the woman and needed antibiotics in case they had also been exposed. He also helped administer questionnaires to postal workers and the 16 local contacts.

While the state has no definitive answer as to how the woman was exposed, evidence suggests it might have been from cross-contaminated mail.

Before September 11, Griffith was investigating a tuberculosis outbreak in a correctional facility and preparing to begin a surveillance project on Lyme disease. He expressed amazement at the breadth of experiences he has had over such a short time period.

He said state epidemiologist Dr. Jim Hadler and the state's Epidemiology Program Coordinator Dr. Matt Cartter (EIS '83), who was Connecticut's first EIS officer, have provided him with a "great training experience" – one that has helped him decide on a career in public health. Griffith plans to combine his interests in public health and the environment. Eventually, he hopes to teach. Whatever challenges lie ahead, he knows the EIS has prepared him well.

EIS PROFILE

Marta Guerra

Years in EIS: 2000-2002

Age: 44

Hometown: Lakeland, FL

Assignment: Worked on efforts to contain Ebola outbreak in Uganda, investigated Q fever outbreak in Wyoming, and hopes to educate the public on rabies during her time as an EIS officer.

Education: University of Pennsylvania (B.A., 1979); University of Florida (D.V.M., 1985); University of South Florida (M.P.H., 1995); University of Illinois, Champaign/Urbana (Ph.D., 2000).

Where She Is Today: Guerra lives in Atlanta, where she is currently serving as an EIS officer.

2000



From the Tropics of Africa to the Plains of Wyoming, Veterinarian Prevents Disease

Growing up in the multicultural environments of Havana, Cuba and Washington D.C., Marta Guerra developed a keen interest in international health. Guerra is a veterinarian and holds a Master's degree in Public Health and Ph.D. in tropical medicine. Today, she is an Epidemic Intelligence Service Officer in CDC's viral and rickettsial disease program.

Immediately after being selected as an EIS officer, she was called to Uganda to help control an Ebola hemorrhagic fever outbreak. EIS officers must be prepared to leave their homes indefinitely with short notice if there is an outbreak, but it is a sacrifice they readily make. Such was the case with Guerra. After only two days' notice, she found herself on a plane to Gulu.

Guerra calls her stint in Uganda her most significant experience to date. "It is very rewarding to be able to put into practice what you have been studying," Guerra recalls. Because the strain of Ebola was not as virulent as those found in past outbreaks in other countries, relief teams were able to ensure the survival of more victims. Still, due to the highly infectious nature of the disease and the high death rate (58%), the need to counter the outbreak was dire. Guerra stated that certain Ugandan customs may facilitate the spread of the disease, as families often care for the sick at home and in hospitals, handle the bodies and many villagers attend the funerals of the victims.

EIS relief in Uganda was two-fold. Guerra and her team worked tirelessly to track the spread of the disease and also to educate village residents on prevention and survival. Guerra witnessed firsthand the horrifying effects of the disease, and also the difficult period following recovery. One of the field duties of the EIS officers was to assist the survivor's transition back into society. Out of fear, village members would often burn the houses and possessions of the infected. Family members were reluctant to accept the survivors back into their lives. "You think, 'great, I've survived,' but then you return home and you have nothing," said Guerra. Guerra and other EIS officers educated village residents about Ebola and assured them they were not in danger. This helped to quell their fears and reservations. "It was a very positive experience, the people were glad to have us there," Guerra recalls.

In the race to get ahead of this terrifying disease, Guerra's team used its database to track any contacts that individuals may have had with other people. Those people could then be brought in for immediate diagnosis and treatment, thus increasing their chances of survival and preventing the spread of the disease. Not only were Guerra and her team able to help slow the spread of the disease from five new cases per day to only one new case per week, they were able to do it in less time than they had originally anticipated. Although she was planning to spend Christmas working in Uganda, she was able to return home for the holidays. Guerra credits the Ugandan Ministry of Health and the Ugandan Red Cross for their quick and effective campaign. Guerra and her team left behind equipment and trained the locals to continue surveillance efforts. "It is a wonderful feeling to be able to accomplish what you set out to do," says Guerra.

With so many public health threats in the world, Guerra says CDC has kept her busy with a variety of assignments. Shortly after returning from Uganda, she was sent to investigate a Q fever outbreak on a ranch in Wyoming. Q fever causes stillborn births and spontaneous abortions among goats and sheep, and the fetal tissue is highly infectious, causing acute pneumonia in humans. In the middle of winter, Guerra and a team of health professionals from the U.S. Department of Agriculture and the Wyoming Department of Health took samples from livestock, interviewed people with possible exposures, and tracked down anyone who may have come into contact with the infected animals.

Back in Atlanta, Guerra hopes to direct her future efforts as an EIS officer toward a campaign to increase public awareness of rabies and its wildlife reservoirs. The number of cases of rabies increased in the U.S. during the past year, and all the U.S.-acquired cases were attributed to strains of the rabies virus associated with bats. In order to curb this disease, she feels the public needs to be educated on the modes of transmission and which species are potential carriers of the virus. From the tropics of Africa to the plains of Wyoming, Guerra's experience at CDC has prepared her for a lifelong career protecting the public's health.

EIS PROFILE

Jim Hayslett

Years in EIS: 2000-2002

Age: 44

Hometown: Syracuse, NY

2000



Assignment: Investigates disease outbreaks, most recently a large botulism outbreak in the Dallas/Fort Worth area, as the EIS officer assigned to the Texas Department of Health. After anthrax exposure in the Capitol, was deployed to Washington, D.C. to assist local health officials in response to the anthrax attack.

Education: University of Kentucky (B.S., Pharmacy, 1984; PharmD, 1985); University of Oklahoma (M.P.H., 1998; Post-doctoral Fellowship, 1999).

Where He Is Today: Hayslett lives in Austin, Texas, where he is serving as the third pharmacist-trained disease detective in the EIS's 51-year history.

Pharmacist-Turned-Disease Detective Helps Trace Path of Anthrax in Nation's Capitol

Terrorism has touched CDC disease detective Jim Hayslett more than once. In 1995, he worked and trained at the University of Oklahoma Health Sciences Center, just 10 blocks from Oklahoma City's Alfred P. Murrah Federal Building that was bombed on April 19 of that year.

After September 11, 2001, he was one of many disease detectives from CDC's Epidemic Intelligence Service (EIS) deployed to five sites experiencing anthrax attacks. In the EIS' 51-year history, Hayslett is the third ever CDC disease detective with a pharmacy background. Hayslett's training made him an obvious choice to assist local health officials when Senator Daschle's office received an anthrax-tainted letter, requiring that thousands of Capitol and U.S. Postal Service employees receive chemoprophylaxis. He arrived in Washington, D.C. on Oct. 18 and remained for 16 weeks.

Hayslett and others on the Epidemiology and Intervention Team had the tough task of entering anthrax-contaminated buildings to determine the exposure route and learning quickly about the mechanization in postal facilities and building air-handling systems. The goal: to minimize further risk. The team also served with other fellow Public Health Service officers to make sure that those people who were exposed, received appropriate treatment. They implemented a system to address side effects to ensure postal workers could finish their supply of antibiotics.

Hayslett followed the epidemiologic trail in the 500,000 square-foot U.S. Postal Service Brentwood Processing and Distribution Center in Washington, D.C. where he was part of the team that went through the facility prior to its closure – a task that later required him to take 60 days of antibiotics to prevent anthrax infection. He and other investigators looked at where there was co-mingling of air facilities, interviewed workers on what routinely happened in their work space, and studied how the mail-processing procedure could affect letters transiting the facility.

"We asked the things that people don't routinely think about, such as, 'Does someone run a fan at their desk?' That changes the air flow pattern we think about. This work

required us to deal directly with the folks who have been affected. We don't want to be too many layers above that," he said.

On working with the local health department, Hayslett noted, "People here appreciate what we do and vice versa. This issue would have overwhelmed any health department in this country. Our goal was to work within the existing infrastructure, and to build relationships and strengthen the bridges between their infrastructure and the rest of the healthcare community."

Hayslett divided his day between investigative work and visits with mail handlers around the metro D.C. area. He spoke with more than 5,000 postal workers in 20 days. Besides advising workers on the importance of taking antibiotics for the full 60 days, Hayslett also answered their questions in an effort to provide them a level of comfort in an uncertain situation.

"It's very helpful to have someone come out and talk to the workers. It's also helpful to be honest and tell them if we don't have an answer," said Hayslett. "We hoped to increase our public health presence in the community and to make these workers our public health partners."

"These types of interactions are pivotal for the public health process. Besides being researchers, we're conduits within the public health infrastructure. We distill complicated public health messages for dissemination in the community and listen to concerns and feedback."

CDC has helped the nation's healthcare system use surveillance mechanisms. Emergency rooms and other healthcare facilities keep track of people coming in with flu-like symptoms and, if their chest x-rays are suspicious, they are evaluated for anthrax. Hundreds of cases need to be evaluated and ruled out in order to find the very few who do have anthrax and to get them immediate treatment.

Prior to the anthrax investigation, Hayslett was busy working on a major botulism outbreak in the Dallas area involving 14 cases. The United States averages between 20 and 25 cases total of the food-borne disease each year. "We thought this was big-time epidemiology, but it has been dwarfed by recent events," he said.

Hayslett credits earlier career experiences for helping him prepare for the challenges of anthrax. He was in Albuquerque, New Mexico, on September 11 participating in U.S. Agency for International Development (USAID) Disaster Assistance Response Training, which trains public health assessment teams to respond to disasters in foreign countries. He also worked six years in the Indian Health Service on the Navajo Indian Reservation, where he and other staff handled an estimated 600,000 outpatient visits yearly.

Hayslett, who looks forward to remaining with CDC as an epidemiologist, thinks the role of EIS is important because of the expertise that can be brought to bear quickly. "Knowing that some of the best minds in the world are dedicated to these challenging public health problems makes a big difference," he said. "Recent events have shown that public health professionals at the local, state and federal levels will do whatever it takes to keep our communities safe."

EIS PROFILE

Kristy Murray

Years in EIS: 1999-2001

Age: 28

Hometown: Atlanta

2000



Assignment: The sole EIS officer assigned to the CDC Bioterrorism Preparedness & Response Program, Murray has been involved with several investigations, including investigating an outbreak of unknown illness in New York City that later turned out to be West Nile encephalitis. She recently returned from a three-month assignment to help eradicate polio in Bangladesh.

Education: Texas A&M University (B.S., 1994 and 1995, D.V.M., 1998).

Where She Is Today: A resident of Atlanta, Murray is completing her second year in the EIS with the Bioterrorism Preparedness & Response Program in preparation for a career in public health.

EIS Comes Full Circle with Renewed Bioterrorism Surveillance

Dr. Kristy Murray is used to keeping her bags packed. Currently the sole EIS officer focused on bioterrorism preparedness, Murray can be called at a moment's notice to potential incidents at any point around the globe. Since joining the EIS in 1999 and being assigned to CDC's bioterrorism preparedness and response program in Atlanta, Murray has been involved in several investigations, including investigating an outbreak of unknown illness in New York City that later turned out to be West Nile encephalitis.

"During my second week as an EIS officer, I was called to help with the investigation. It was unusual because it was a cluster of cases of encephalitis," recalls Murray. "A cluster of unexplained illnesses could be a key indicator for bioterrorism. Other red flags could be cases of pulmonary anthrax or large numbers of people becoming ill in a short period of time. However, early on, the characteristics of this epidemic were thought to be consistent with a natural outbreak."

Like all EIS officers, Murray's job is to isolate the cause of an outbreak, prevent its spread and get out public health messages to people who could have been exposed. The 28-year old veterinarian and graduate of Texas A&M University is among the youngest in her EIS class. Murray says she always planned to be a veterinarian specializing in small animal medicine until she discovered the excitement of public health service while doing field work for the CDC as part of a post-doctoral fellowship.

"I really enjoy being off at a moment's notice and not really knowing what's going to happen next," she says.

Her detective work helped public health authorities determine that the West Nile virus was transmitted through mosquitoes, prompting officials to take steps to control the mosquito population. Murray has since helped set up a national surveillance system to track West Nile virus, focusing on early-warning signs such as increased fatalities among birds and horses, who often are struck with the virus before humans.

In November 1999, Murray was part of a team that traveled to Seattle when the local health department asked CDC to help set up disease surveillance at area hospitals for infectious diseases that could possibly originate from an act of bioterrorism during the

World Trade Organization (WTO) conference. Officials anticipated thousands of protesters, from environmentalists to trade union leaders, who came to oppose the WTO's free-trade stance. Fortunately, no public health threat materialized.

"We were set up in eight emergency rooms and were looking for spikes in different syndromes consistent with an early epidemic that might be related to bioterrorism," says Murray, who did face her share of hazards. She found herself caught in the middle of clashes between riot police and angry protesters while commuting between the hospital and her hotel.

"I'm probably one of the only EIS officers who can say they've been tear gassed in the line of duty," she says.

Murray also participated in bioterrorism exercises at the local, state and federal level, including exercises in Denver, New Orleans and Baltimore, and one organized through the military at Ft. Benning, Georgia. During the exercises, CDC and local public health and law enforcement personnel simulated how they would respond to an actual bioterrorism event to test the readiness of the local and federal public health infrastructure, clarify roles and improve teamwork across organizations.

"My role as the EIS officer was to determine what was going on biologically – to find the common link to the outbreak using classic epidemiology and to get out public health messages to people who could have been exposed. Exercises like these and strengthening our public health infrastructure will prepare us to detect, respond to, and prevent outbreaks more quickly."

She expresses pride in being part of the bioterrorism surveillance effort. "Bioterrorism concerns during the Korean War in the 1950's led to the establishment of the EIS. We've almost come full circle."

According to Murray, the renewed focus on bioterrorism is a result of better awareness in the United States of biological weapon capabilities in other countries, underscored most recently by Iraq during the Persian Gulf War. The 1984 outbreak of Salmonella food poisoning in Oregon caused by intentional contamination of restaurant salad bars is the only known case of bioterrorism in the U.S.

Murray notes that all states now have bioterrorism coordinators and more resources in the form of CDC grants to strengthen states' public health infrastructure and capability to track diseases, whether from bioterrorism or not.

"Not only will we be able to respond more quickly to a bioterrorism event, we also will be able to better handle natural outbreaks, which is good for everyone," she says.

As her EIS assignment comes to an end in July 2001, Murray hopes to continue to work in the public health arena with a career at CDC.

"I love what I do. When I get up in the morning, I want to go to work. I think I'm very, very lucky."

EIS PROFILE

Pratima Raghunathan

Years in EIS: 2000-2002

Age: 33

Hometown: Rochester, NY

2000



Assignment: Raghunathan has investigated meningitis outbreaks in two nations – in the United States in the state of Ohio, and in Benin, West Africa. Raghunathan has also worked in Ghana, studying Buruli ulcer disease, an infectious disease that leads to massive skin ulceration if left untreated.

Education: Yale (B.S. 1989); University of California, San Francisco (Ph.D. 1997); University of California, Berkeley (M.P.H. 1998).

Where She Is Today: A resident of Atlanta, Raghunathan is in her second year as an EIS officer, assigned to CDC's National Center for Infectious Diseases.

A Tale of Two Countries: Controlling Meningitis in the U.S. and Benin

Pratima Raghunathan knows first-hand what it's like to be called to an investigation at a moment's notice. While working on a case control study on Buruli ulcer in Ghana, and surveying the aftermath of meningitis in Benin, Africa, Raghunathan took a short break from her work in June 2001.

"I was out all day at a wedding in New York, and when I returned to my parents' home there was a message on the machine from my supervisor, Nancy Rosenstein, asking me to call her," Raghunathan recalls.

"It was late and I was hesitant to call Dr. Rosenstein back, but I did. She explained that two 15-year-old high school students had died from meningococcal disease, both serogroup C, within three days of one another near Alliance, Ohio. A third case had just been hospitalized with suspected meningococcal disease, and the state was requesting CDC assistance," says Raghunathan.

Raghunathan learned that the first two cases attended West Branch High School, and the third attended nearby Marlinton High School, which triggered an alert because of their closeness in time and space.

The response: launch a massive vaccination campaign.

"Clusters are rare – there are approximately 10 clusters per year in the U.S. – so any one particular state may not have recent experience in responding to these situations," Raghunathan says. "CDC has developed guidelines to help state and local health departments decide what measures to take to control these outbreaks. My role was to assist them in applying these guidelines, including how to select the target group for vaccination." With the local and state health departments in charge of the vaccination campaign, Raghunathan's job shifted to educating the public about meningitis.

"There was tremendous concern and anxiety expressed by many community members who did not have very much information about meningitis," Raghunathan says. "CDC worked closely with the state and local health departments to inform the public about

the disease. Our team established a hotline, conducted media briefings twice daily, and talked to key groups like doctors and school officials. We think this strategy helped calm the community's fears." By the time of the Ohio outbreak, Raghunathan had already gained expertise in controlling meningitis epidemics overseas. She had just returned from Benin, West Africa, where she worked with the Benin Ministry of Health to control the spread of meningitis which had already struck thousands of people.

There are differences between Raghunathan's investigation of meningitis in Ohio and the disease in Benin.

Raghunathan explains that in Benin, the vaccine supply is very limited, even though the region anticipates outbreaks every year. This was not the case in Ohio where there was enough vaccine for everyone.

"In Benin alone, there were approximately 600,000 doses of vaccine but more than two million people were at risk," explains Raghunathan. "We drove to affected regions with Ministry of Health officials to decide which districts would be vaccinated based on surveillance data. It was sobering to realize that our choices would have an impact on so many people."

In the end, 350 people died in Benin and 9,000 were afflicted. In some districts, the epidemic touched one of every hundred people. Throughout Africa, 36,000 people became ill from meningitis and 3,600 died.

"Given the enormous suffering caused by meningococcal disease, we want to move beyond outbreak control to prevention," Raghunathan says. "We're optimistic about new vaccines already being used in England and Canada promise to have a great impact on the disease. The Gates Foundation has just donated \$70 million towards the development of similar improved vaccines for Africa. Companies are working on vaccine formulations appropriate for use in the United States and we expect them in the next three to five years."

The northern region of sub-Saharan Africa is referred to as the meningitis belt because it experiences a meningitis outbreak every year, usually during the dry season, and every eight to 12 years is faced with a large-scale epidemic.

Raghunathan is hoping to spend her second year as an EIS officer studying the aftermath of meningitis in Africa in order to better prepare the region for future outbreaks. At the same time, she will keep her bags packed for the next phone call asking her to get on the next plane to wherever she is needed. Her plans after EIS? To continue her career in public health at CDC.

EIS PROFILE

Jennita Reefhuis

Years in EIS: 2001-2003

Age: 29

Hometown: Beerzerveld, The Netherlands

Assignment: Analyzes birth defect risk factors in women (specifically, fertility treatments and occupational exposure); was deployed to Washington, D.C., Virginia, Florida and New Jersey to assist with bioterrorism data analysis.

Education: University of Nijmegen (Master's in Epidemiology, 1995); University of Groningen (Ph.D. in Epidemiology, 2000).

Where She Is Today: Reefhuis lives in Atlanta, where she is serving as an EIS officer.

2000



Dutch Disease Detective Helps Four U.S. States Analyze Bioterrorism Data

Dr. Jennita Reefhuis loves solving puzzles. An epidemiologist from Holland with a background in birth defects epidemiology, Reefhuis was enjoying her first year as a CDC disease detective in the National Center on Birth Defects & Developmental Disabilities when Sept. 11 changed her world.

Rather than attend her brother's wedding in The Netherlands at the end of September, Reefhuis began an odyssey that would take her to four states over two months to assist with a critical, if overlooked, part of bioterrorism surveillance – data analysis.

After the attacks on the World Trade Center and Pentagon, hospitals were on alert for signs of bioterrorism. On September 20, Reefhuis attended meetings at the Washington, D.C. Health Department and was dispatched to the Virginia Health Department where she put her computer skills to use. She helped local officials collect and analyze surveillance data from area hospitals. Fortunately, there were no spikes in emergency room visits that indicated a bioterrorism event at that time.

"We never found anything – we were looking for any kind of bioterrorism – a certain set of symptoms or a combination of those symptoms that could point to a specific disease," said Reefhuis, who returned to Atlanta on October 2.

Two days later, she got another call – this time to go to Florida, where the first case of anthrax had been diagnosed. While some of the CDC disease detectives went to West Palm Beach where the patient lived, Reefhuis headed to the Florida State Health Department in Tallahassee.

"They already had information from emergency rooms all over the state, but they didn't have a system in place to track that information and look for peaks in emergency-room traffic," she said.

Reefhuis spent the weekend in her hotel room on a computer, creating an Excel spreadsheet that state officials could use to quickly compare the number of ER visits reported against the typical number of ER visits to area hospitals.

"If there were a sudden increase in the number of ER visits, that would trigger further attention to determine if the cause was a bioterrorism event," Reefhuis explained. "From early morning to late at night, I tried to get the program to work and I consulted with CDC people to make sure I was setting it up correctly." In the end, she was able to get the program to run smoothly and the state health officials still use the spreadsheet for their emergency room surveillance.

"It sounds very boring, but it's important to have good information in order to make good public health decisions. I love this type of work," said Reefhuis.

Most comfortable dealing with statistical data, Reefhuis admitted she never wanted to be a physician because of the frequent patient contact. Working as an epidemiologist in the EIS has allowed her to focus on the aspects of medicine that have always fascinated her, exploring how the human body works, and solving the puzzle of why it doesn't work in some people."

"For me, being an EIS officer is a perfect job," she said.

Her people shyness was put to the test when the inhalation anthrax trail in New York and Washington led to a postal plant in Hamilton, N.J. Reefhuis was part of the first CDC team deployed to New Jersey on October 18th.

"We got in at 9 p.m. and were placed in a conference room. There were 25 people around the table – all State Health Department and U.S. Postal Service staff," said Reefhuis, recalling that the meeting went until 1 a.m.

She said the task facing the team was huge. "Our goal was to determine the extent and means of exposure, and to prevent further illness," said Reefhuis, who helped create questionnaires and interviewed workers by phone and in person. And while other team members went to talk to patients or set up surveillance mechanisms, Reefhuis was assigned to learn everything about the postal plant – the process of how mail is handled, where it is sent and the location of each employee. She became such a common sight at the plant that one Postal Service supervisor walking with her joked with a group of employees that she would be his replacement when he went on vacation.

Reefhuis said, "We looked at how the postal facility functioned, searching for clues to how some of the workers were exposed to anthrax. We also tried to determine who had been at risk of being exposed and needed to take the antibiotics. We also made sure that all these people knew they needed to take antibiotics to reduce their risk of getting sick. Another purpose of determining the mail flow in the facility was to try to explain how people that did not work at the facility could have contracted anthrax."

After testing for spores throughout the plant, Reefhuis and other team members determined that the public section of the plant was clean. As a result, they assured the public that visited that part of the facility that they faced no risk of contracting anthrax and did not need medication. Approximately 1,069 workers and 178 business visitors who entered the non-public area of the plant were offered antibiotics as a preventive measure.

"In every assignment, I have been able to use something from my previous experience. In Florida I used my statistical skills and in New Jersey, I used my background in occupational epidemiology," she said.

Reefhuis, who went to New Jersey twice in November, finally returning on November 17, said she is certain of one thing: the EIS and CDC can be depended upon to respond when they are called.

"As a whole, all of us feel good about being able to help. I feel very honored," she said. "In EIS, you have a group of people who are willing to go out at a moment's notice. We have a unique range of qualities – MDs, epidemiologists and social scientists – who can investigate any disease. If you called and said it was urgent, you could get 40 people to go this afternoon without a problem. They would go anywhere...without even knowing the destination."

EIS PROFILE

Bill MacKenzie

Years in EIS: 1991-1993

Age: 43

Hometown: San Francisco

1990



Assignment: An EIS officer assigned to the Wisconsin Division of Health in the spring of 1993, MacKenzie was called in to help isolate the cause of a widespread outbreak of illness among Milwaukee residents. The investigation revealed that the cause of the outbreak was *Cryptosporidium*, a waterborne, chlorine-resistant pathogen that had contaminated water supplies in one of the city's water treatment facilities.

Education: University of California at Davis (B.S., 1980); University of California, San Francisco (M.D., 1984); University of Arkansas Medical Sciences (Resident in Internal Medicine and Pediatrics, 1984-1988); Stanford University Medical School (Fellow in Infectious Disease, 1989-1991).

Where He Is Today: A resident of Atlanta, MacKenzie currently heads up outbreak investigations and FoodNet (a CDC-supported research program for foodborne diseases) for the Georgia Division of Public Health.

Raising the Standard on Safe Drinking Water

In the spring of 1993, thousands of Milwaukee residents were suffering from watery diarrhea and intestinal cramps. More than 400,000 people were estimated to have been infected, causing massive absenteeism among school children, health workers and other professions. Bill MacKenzie, an EIS officer assigned to the Wisconsin Division of Health, recalls getting a call from the city's epidemiologist requesting help with isolating the cause of the outbreak.

"It was clear that they needed assistance," says MacKenzie, who along with four colleagues at the division, headed to the city offices to meet with the mayor and city health officials. "We knew that when large numbers of people are ill with diarrhea in a large geographic area, one cause has to be from a product that is widely distributed," MacKenzie says.

It didn't take them long to zero in on a possible cause – the city's drinking water – and particularly, drinking water from the southernmost of Milwaukee's two water treatment plants. At the time, Milwaukee residents and the rest of the country trusted that their drinking water was safe, and some considered it to be "sterile," MacKenzie says.

"The first bit of information we got was that the southern water treatment plant had increases in turbidity, which is a measure of how well the water is filtered. What we didn't know at the time was that those increases had been unprecedented compared to the prior 10 years. They were really off the chart for that water department."

The second clue came later that day, when laboratories around the city confirmed seven cases of *Cryptosporidium*, a waterborne, chlorine-resistant pathogen that causes diarrhea. "It was known among public health officials that drinking water could be associated with a *Cryptosporidium* infection," MacKenzie notes. *Cryptosporidiosis* was first recognized in humans with weak immune systems in 1976 and later was proven to also affect people with normal immune systems. In fact, MacKenzie recalls that a number of Milwaukee patients who had AIDS or otherwise compromised immune

systems were not able to recover from their cryptosporidiosis and died with the infection.

With the initial findings in hand, Milwaukee officials immediately issued a boil-water advisory to keep the infection from spreading while MacKenzie and his public health colleagues continued their investigation. They surveyed nursing homes throughout the region for signs of the infection and found a much higher prevalence of diarrhea among homes in southern Milwaukee with the exception of one, which used a private well for its water supply. Then, they conducted massive telephone surveys with residents, which showed a much higher infection rate for residents living or working near the southern water treatment plant. Laboratory examination of specimens ruled out other known pathogens as the cause. The investigative team even melted large, 60-gallon blocks of ice made during the peak period of the outbreak from a nearby ice maker to prove that the water contained *Cryptosporidium*. According to MacKenzie, the need to gather "overwhelming" evidence on the outbreak's cause was necessary.

"When you're faced with a large-scale outbreak, people are always going to question whether or not the cause is primarily due to the water," says MacKenzie. "Our investigation helped the water industry officials in the United States realize they had a problem and they needed to do something about it. It helped public officials understand that they needed to spend more resources to maintain safe water supplies. The outbreak also re-educated everyone, including doctors, that *Cryptosporidium* could cause disease in people with normal immune systems."

The documentation on the Milwaukee outbreak helped put *Cryptosporidium* and the need for better drinking water treatment "on the radar screen for water engineers, politicians and regulators," adds MacKenzie. To their credit, residents in Milwaukee complied with the advisory to boil water, which effectively killed the pathogen.

MacKenzie says the quality of public water systems has improved significantly since 1993, but there are still areas for improvement. Water treatment plants in larger cities with access to public capital have made improvements, including using advanced techniques to monitor water quality and better water filtering techniques to make the water safer. However, smaller cities without resources still struggle to maintain their water supplies adequately.

Concerns about *Cryptosporidium*-contaminated drinking water extends beyond our borders. Two years ago, while preparing for the Olympics, Sydney, Australia, had a *Cryptosporidium* scare. When using a new testing method the pathogen was found in Sydney drinking water. Those tests turned out to be false, but nevertheless caused the city to issue three boil-water advisories.

And, *Cryptosporidium* continues to cause problems in recreational waters, such as swimming pools, lakes and rivers, which likely are the largest source of cases, according to MacKenzie. Since these cases occur predominantly in children, "CDC has been working on communicating the risks of contaminated recreational water such as swimming pools to parents for several years now."

Following EIS, MacKenzie went on to work at CDC for five years until 1998. First, he trained state-based EIS officers in field epidemiology at the CDC's Epidemiology Program Office. Later, he worked at the parasitic disease program, helping the EPA and

CDC in their efforts to come up with a national estimate for waterborne diseases. In 1998, he left CDC to travel to Kosovo, where he assisted with the rebuilding of the country's public health system. He currently heads up outbreak investigations and FoodNet (a CDC-supported research program for foodborne diseases) for the Georgia Division of Public Health. He continues to strongly support the EIS.

"The EIS is a wonderful training program to provide bright, young people an opportunity to work in an applied setting and use their knowledge to improve the health of the population," he says. "It also works well for state and local health departments and the CDC to have these bright minds thinking in new and different ways to keep the wheels of public health turning and to keep us from stagnating.

"My EIS experiences in Milwaukee and other areas of the world certainly have made me a better epidemiologist and physician. It's helped me understand the broader context of how public health affects society, not just one patient at a time."

EIS PROFILE

Martha Rogers

Years in EIS: 1981-1983

Age: 49

Hometown: Commerce, GA

1980



Assignment: In July 1981, Rogers was assigned to CDC's viral disease program, and worked on some of the first investigations of cases of HIV/AIDS. She spent the next two decades focused on eliminating HIV transmission in children by first studying how it is transmitted and then implementing an effective prevention strategy in the public health system.

Education: Emory University (undergraduate work); Medical College of Georgia (M.D., 1976).

Where She Is Today: A resident of Decatur, GA, Rogers has spent the past 20 years fighting the spread of HIV in one of the most vulnerable populations, infants. She currently is assigned to CDC's National Center for HIV, STD, and TB Prevention, and is on temporary duty to the Task Force for Child Survival and Development, serving as a visiting senior scientist.

Tracing the Routes of HIV, Combating its Spread in Children

...It is one of the five leading causes of death in the world.

...Some 36 million people are infected worldwide.

...There are an estimated 40,000 new infections in the U.S. each year.

The statistics, of course, refer to the AIDS epidemic, a household word for Acquired Immunodeficiency Syndrome that was synonymous with isolation, pain and death when it was first discovered. In the early 1980's, it was an unknown agent that was attacking seemingly unrelated segments of the population – gay men, intravenous drug users, young children, and persons with hemophilia.

Long before Hollywood celebrities raised awareness of AIDS by donning red ribbons, a handful of EIS public health heroes combated prejudice, public apathy, government budget cuts, and bureaucratic red tape, to trace the early cases of AIDS. In the process, they identified the key risk factors, pinpointed the virus's transmission paths and raised awareness about how to safeguard against becoming infected.

One such EIS officer was Martha Rogers, a young pediatrician intrigued by the opportunity to work "with diseases of unknown origin." A 1976 graduate of the Medical College of Georgia, Rogers was assigned to CDC's viral disease program in July 1981, and became a key member of the CDC task force focused on the first cases of AIDS.

"The CDC assembled many people with different types of expertise. The viral disease program was called to do a laboratory scan. I coordinated this effort, as various health departments sent us laboratory specimens. We were not clear on the cause of the disease, and were hoping to gain some clues through extensive laboratory testing," recalled Rogers.

Rogers was joined by EIS officers Harold Jaffe and Mary Guinan from CDC's sexually transmitted disease program, Harry Haverkos from the parasitic diseases program,

Polly Thomas, an EIS officer assigned to the New York City Health Department, and David Auerbach, a Los Angeles-based EIS officer, to develop a case definition and to begin conducting national surveillance. Based on a case-control study completed in early 1982, "Analysis of the interview data clearly pointed to sexual activity as a key transmission path for acquiring HIV," recalled Rogers.

However, because the disease had initially struck only the gay population, many people in the general public considered the disease a "curiosity" and not something that affected them. That soon changed when EIS investigators detected the disease in children and in blood transfusion recipients beginning in 1982.

One of her more unusual and heartfelt investigations involved a mother who had acquired AIDS from her infant, who had contracted AIDS from a blood transfusion. The baby suffered from gastrointestinal problems, which exposed the mother to the child's secretions while caring for him. The toddler later died. The mother continues to live with AIDS with help from medication and has stayed in touch with Rogers over the years.

"I really admire this mother and others like her who were willing to talk to EIS officers and share with us their personal and often painful stories. They were willing to do this for the greater good, because often it was too late to help them or their children. They really contributed to the knowledge that HIV can be spread through exposure to blood and body fluids. This knowledge allowed us to come up with guidelines for universal precautions, now in widespread use in the medical and dental care system to prevent the spread of HIV," said Rogers.

For example, universal precautions include the proper disposal of anything contaminated with blood or body fluids, and the routine use of gloves in dentist offices, practices that didn't exist before HIV, according to Rogers.

After completing her EIS stint, Rogers continued at CDC for her preventive medicine residency and then joined the AIDS effort full time, focusing the rest of her career on eliminating pediatric cases of HIV. She helped set up the first surveillance system to track HIV in children. She studied the dynamics of transmission among populations of mothers and infants in the United States and in Africa. These data helped scientists formulate some of the first intervention strategies. For example, a now famous NIH-funded clinical trial, AIDS Clinical Trial 076, found that if a mother takes antiretroviral medication before and during childbirth, and her child is given antiretrovirals after birth, the child will have a better chance of avoiding HIV during birth.

Cases of pediatric AIDS in the United States have been drastically reduced, thanks to this preventive approach. While AIDS continues to ravage populations in Africa, advances in treatment have prolonged life for many in the United States. "People survive but at a price," Rogers said. "Antiretroviral medication can cause debilitating side effects, such as fatigue, anemia, nausea, and others, and viral resistance to the drugs can develop, making the drugs less effective. The challenges we face now are in developing new, more effective treatments and, even more importantly, on preventing infection in the first place – particularly among young people."

Rogers, a working mom with two teenagers of her own, believes reaching adolescents and keeping them from engaging in unsafe behaviors are the key to curbing the spread of HIV in the future.

"It's during their adolescent years that kids begin experimenting with adult behavior. If you can keep them out of trouble by educating them on the dangers of high-risk behaviors and the importance of safe behaviors, you have a good chance of keeping them healthy."

A senior scientist with CDC's HIV prevention program, Rogers has spent the past year working as a visiting scientist with the Task Force for Child Survival and Development, an organization affiliated with Emory University and dedicated to improving health and human development around the world. Rogers finds her current role at the Task Force an appropriate place given her longstanding interest in children's health issues.

"My work now really focuses on keeping kids from getting into trouble from a health standpoint," she said. "During my work in HIV, I saw a lot of people who had gone down a very bad path in life – a path of abusing drugs and being highly sexually active. If you wait until people have already adopted that kind of lifestyle, it's very difficult for them to change their behavior. Our goal should be to teach children and young people to adopt healthy lifestyles."

Of her more than 20 years spent on the HIV/AIDS epidemic, Rogers expresses a sense of satisfaction with her role in helping stem the spread of HIV among children, and in the hands-on education she received from some of the best epidemiologists at CDC. Her mentors were Jim Curran, who headed the AIDS effort at CDC in the 1980s, and EIS alumnus Harold Jaffe. Jaffe currently directs CDC's HIV, STD and TB laboratories, where he is focusing on developing more accurate, rapid tests that can detect all the new types of HIV as well as supporting CDC's work on HIV vaccines.

"They were very supportive, wonderful mentors who were very caring of me," said Rogers. "The EIS is very much a hands-on program. Mentors were how you learned. We were taught on the job – it's about seeing and learning as you're doing."

She concluded: "Most EIS officers go out on an epidemic, watch it unfold and they leave within a few weeks or months. My epidemic has taken place for more than two decades, and I am continuing to see it through. It has been enormously challenging and rewarding for me."

EIS PROFILE

José Cordero

Years in EIS: 1979-1981

Age: 53

Hometown: Camuy, Puerto Rico

1970



Assignment: Cordero joined the EIS in 1979 and was assigned to the birth defects program. His first EIS investigation of three cases of a rare genetic disease called Bartter Syndrome uncovered that the infants had a different illness caused by chlorine deficiency in their soy-based baby formula. As a result, the Infant Formula Act of 1980 was enacted, requiring that any food intended to be the sole source of nourishment contain all the necessary nutrients for babies to thrive.

Education: University of Puerto Rico (B.S., 1969; M.D., 1973); Harvard University (M.P.H., 1979).

Where He Is Today: A resident of Atlanta, Cordero is assistant surgeon general and deputy director of CDC's National Immunization Program (NIP). In this role, he has led NIP's efforts that have resulted in record low levels of childhood vaccine-preventable diseases. He is a former president of the Teratology Society, a research professional society devoted to the prevention of birth defects and is active in the American Public Health Association, chairing the Epidemiology Section from 1997 to 1999.

A Lifelong Commitment to Preventing Diseases in Children

As a pediatric resident at Boston City Hospital in the mid-1970s, José Cordero treated many children with diseases that could have been prevented. He often thought, "Where do I want to spend my time – treating diseases or finding ways to prevent them?"

The answer came after Cordero heard about a unique, on-the-job experience at CDC known as the Epidemic Intelligence Service (EIS). He immediately applied for the program and joined the class of 1979. Cordero, a Puerto Rico native, was one of the first Hispanic EIS officers to join CDC's elite corps of disease detectives.

"The EIS was a dream come true," recalled Cordero, who was assigned to CDC's birth defects program. Then 30 years old, Cordero came to the position highly qualified, with a master's degree in public health from Harvard University and six years of clinical pediatric experience.

"My first investigation demonstrated how we in public health can have an impact by first detecting a disease, then reporting our findings and seeing it translated into new policy," Cordero recalled.

He was brought in to investigate a cluster of three cases of infants in Tennessee who appeared to have a rare genetic disease called Bartter Syndrome. The babies suffered from vomiting and dehydration, and had a condition called metabolic alkalosis. This condition can be caused by the loss of potassium and chloride, two essential minerals in the diet. The cause of the infants' illness was pinpointed to a chloride deficiency in their soy-based baby formula.

"Chloride is one of those elements that needs to be replaced daily because it is lost through the kidneys," Cordero explained.

Within days, Cordero and a fellow EIS officer Frank Greenberg found 27 more cases by contacting hospitals around the country. Their research firmly established the infant formula as the link to the infants' condition. Within a week of the EIS first being contacted, the formula was off the market.

They published their research findings in CDC's scientific publication, the Morbidity and Mortality Weekly Report. This and other research led Congress to pass the Infant Formula Act of 1980, signed into law by President Jimmy Carter. This law simply states that any food intended to be the sole source of nourishment for infants must contain all the nutrients the babies need to grow healthy.

Cordero was also assigned to an EIS investigation to determine whether Bendectin, a drug taken by half of all pregnant women to alleviate nausea and vomiting, was causing congenital birth defects, or babies being born with missing extremities.

"Our study conclusively showed that Bendectin did not cause birth defects," Cordero said.

Cordero's early EIS work formed a basis for a career at CDC that has been defined by steady improvements in children's health. He was part of a team that linked folic acid in women's diets as one way to prevent birth defects. He co-authored a study, with former EIS officers, Joseph Mulinare, David Erickson and Robert Berry, that showed that women who take multivitamins daily significantly reduce the chance of their babies being born with neural tube defects, namely, spina bifida and anencephaly. Subsequent studies showed that folic acid was the key nutrient.

Those findings led the Public Health Service to recommend that all women capable of becoming pregnant should consume at least 400 micrograms of folic acid to reduce their risk of having a pregnancy that would result in a neural tube defect. The FDA also changed its regulations to require enriched cereals, breads and pastas to include folic acid.

This work had far-ranging effects beyond the United States. In China, a program that provided folic acid to women who were registering to marry led in some areas to an 85 percent reduction in neural tube defects among women who took folic acid before pregnancy began. Some countries also have added folic-acid supplements to cereals.

Cordero also joined two other Hispanic EIS officers, Gil Chávez and José Becerra, to conduct one of the first studies of birth defects among racial and ethnic groups in the United States. Using data from the Birth Defects Monitoring Program, they documented that spina bifida is most common in the U.S. population among Hispanics.

"We also learned that spina bifida strikes African Americans at about half the rate of whites and Hispanics," he said, noting that the varying needs for folic acid among population groups are a combination of environment and genetic susceptibility.

This research enabled the CDC to establish folic acid programs in Puerto Rico and along the U.S.-Mexican border, where the most vulnerable populations lived.

In early 1994, Cordero joined the National Immunization Program as deputy director. He brought a child-health focus to the job as the program implemented the Childhood

Immunization Initiative that intended to rapidly increase immunization coverage among pre-school children.

"In the last five years, the progress we have made in childhood immunizations has been remarkable," said Cordero, pointing out that the percentage of children completing the recommended vaccinations has gone from about 60 percent to over 90 percent for the most critical initial vaccine doses. "Today, we are enjoying the highest levels of vaccination coverage the U.S. has ever had, and at the same time, we are at record, or near record lows for diseases like measles, rubella and polio."

In September 1999, Cordero was promoted to assistant surgeon general for the U.S. Public Health Service. His future in immunization focuses on rubella, a mild disease among adults, but a cause of child deafness and eye and heart defects when the mother acquires it during early pregnancy.

Cordero also has been active in global efforts to eradicate rubella-caused birth defects in other countries, including hard-hit areas in the Western hemisphere.

"Most cases of rubella today are coming from Central and South America," Cordero said. "We're working with different countries, ensuring that they implement vaccination programs that will eliminate measles and rubella jointly instead of only focusing on one disease at a time."

Cordero strongly endorses the EIS as a worthwhile experience for young medical practitioners to use their investigative skills to improve the health of many people through prevention.

"The EIS for me was the best career move of my lifetime," Cordero said.

The health benefits that have come from the work of Cordero and other EIS officers continue to be felt.

"To me, that's what prevention is all about," Cordero says. "The fact that we have no smallpox and almost no polio today, that's the kind of impact that, to me, brings a tremendous satisfaction. I can look back and say, 'We've done a good job.'"

EIS PROFILE

Jeffrey P. Koplan

Years in EIS: 1972-1974

Age: 56

Hometown: Quincy, MA

1970



Assignment: An EIS officer assigned to the smallpox eradication program, Koplan worked in both domestic and international settings, including in Bangladesh, one of the last outposts of smallpox. Koplan served alongside a team of Bangladeshi doctors, conducting field surveillance to find and treat new cases of the disease. His work and that of other EIS officers contributed to smallpox's global eradication.

Education: Yale University (B.A., 1966); Mount Sinai School of Medicine (M.D., 1970); Harvard University (M.P.H., 1978).

Where He Is Today: A resident of Atlanta, Koplan serves as director of the Centers for Disease Control and Prevention, a position he has held since October 1998. With more than two decades at CDC, Koplan guides the nation's premier public health agency in its prevention activities.

EIS Leads Effort to Eradicate Smallpox from the World

It's hard to believe that a quarter century ago, smallpox existed in the world. One of humankind's greatest scourges, this life-threatening disease caused fever and a dramatic skin eruption that resulted in severe scarring. Millions of people were infected and one in four infected people died from it. It changed the order of secession for a variety of national dynasties. It affected battle and war outcomes. It affected colonization. With no cure, generations watched helplessly as their children succumbed to the disease or were disfigured or blinded by it. In Central and West Africa as well as parts of Asia, smallpox flourished well into the 1970's.

In 1968, the world's public health organizations – led by the United States and the then-Soviet Union – came together to join in the fight to eradicate smallpox from the world. Some of the key foot soldiers of this battle included CDC's cadre of EIS officers and alumni, among them Stan Foster and Bill Foege, graduates of the EIS class of '62, as well as Stan Music, EIS '71, and Donald Hopkins, a former deputy director of CDC who was made an honorary EIS officer in 1985.

Jeffrey P. Koplan, director of the CDC, remembers the period well. As a young EIS officer in 1972, he was assigned to Stan Foster's team in Bangladesh, one of the last outposts of smallpox. His mode of transportation was a converted Red Cross x-ray boat, which enabled him and his Bangladeshi colleagues to quickly reach isolated populations to identify cases and control the spread of the disease.

"I worked with a Bangladeshi team of a half-dozen people. It was exciting. We were finding outbreaks of cases and trying to control them. Smallpox was still rampant throughout the country," recalls Koplan, who came to the EIS with a strong interest in community medicine following his studies at Mount Sinai School of Medicine in New York.

Koplan's initial smallpox work included investigating suspected cases of smallpox coming into the U.S. and educating U.S. state and local public health departments

about ending routine smallpox immunizations. No cases were imported into the U.S. during his service.

In December 1972, Koplan made his first trip to Bangladesh to conduct a double-blind controlled study on a new drug to assess its potential treatment for smallpox. He convinced Dow Chemical to donate free equipment for the study, assembled the necessary supplies, and spent three months running a smallpox ward in the infectious disease hospital in Dhaka.

"We had about 40 patients who ranged in age from 11 to about 45 years old," recalls Koplan. The study eventually concluded that the drug was not effective and CDC abandoned its use. "It was important to establish that there was no treatment because if people thought there was a drug that could treat smallpox, there would be less emphasis on prevention."

During this period, Koplan interacted often with his two mentors – Stan Foster, who at the time was the World Health Organization's country leader for smallpox eradication in Bangladesh and today is a visiting professor at Emory University's Rollins School of Public Health; and Bill Foege, who ran CDC's entire smallpox program and then directed eradication efforts in India. Today, he is senior medical advisor for the Bill and Melinda Gates Foundation. Both men served as role models and helped steer Koplan toward a public health career.

"I thought that they were exceptional in how they lived and how they approached public health as the most exciting opportunity in medicine – the idea of having an impact on a community – on more than one person at a time. They served as a model for what I wanted to do for the rest of my career," he says.

Throughout his two years of EIS work, Koplan recalls seeing steady progress in the eradication of smallpox. He remembers how airports posted yellow signs with the names of countries that still reported cases of smallpox and advised travelers to those countries of the steps to take if they began to have symptoms.

"When I began in the EIS, perhaps 25 or 30 countries were listed. Over time, those lists would whittle down to fewer and fewer in number – from 24 to 18 to 12 to 6. We saved those yellow pieces of paper. Ultimately, it got down to two, three, one country and then no place left."

Koplan's service in the EIS ended in 1974, but CDC's smallpox crusade continued, and, in 1979, two years after the last smallpox case was found in Somalia, the world was declared smallpox-free. Today, Koplan is one of the few, if not the only, Westerner who has taken care of patients with smallpox on a day-to-day basis.

For Koplan, this work from more than 25 years ago was a defining moment for a career that has taken him to his current post as head of CDC.

"For most of us involved in smallpox eradication, it was a lifelong experience. It served to motivate us to continue to work in public health and gave us an unfailing optimism for the success of public health programs even in the face of overwhelming odds," says Koplan.

EIS PROFILE

Philip Landrigan

Years in EIS: 1970-1973

Age: 58

Hometown: Boston

1970



Assignment: Measles surveillance; smallpox eradication program; worked on lead poisoning epidemic in El Paso, Texas; helped co-found Environmental Hazards Activity, which became CDC's National Center for Environmental Health.

Education: Boston College (A.B., 1963); Harvard Medical School (M.D., 1967); London School of Hygiene & Tropical Medicine (MSc, 1977; DIH, 1977).

Where He Is Today: A resident of New York, Landrigan heads up the Department of Community and Preventive Medicine at Mount Sinai School of Medicine and directs Mount Sinai's Center for Children's Health and the Environment.

Leading the Effort to Identify and Prevent Chemical Toxicity in Children

Over the past 20 years, childhood lead poisoning and its effects on children's mental health have declined dramatically in the United States due to limits on lead in gasoline, paint, food cans and other consumer products.

Dedicated EIS officers such as Philip Landrigan first documented the effects of lead poisoning on American children, forever changing public perception and policy.

"When I first came into the EIS in 1970, CDC didn't have an environmental component. The Environmental Protection Agency had not yet been established. Environmental health was not a term that really had reached public or medical consciousness," Landrigan recalls. "Most people at the time had an inaccurate view of what constituted safe blood lead levels. People thought that either you had a terribly serious, often fatal illness or you were okay. There was no gray in between."

Landrigan, a Harvard Medical School-educated pediatrician, played an important role in debunking those preconceptions. In the winter of 1971, he headed to El Paso, Texas, at the urging of the county health department to investigate possible health effects of low level exposure to lead in children living near a large lead smelter. Landrigan knew something about lead poisoning. As a resident at Boston Children's Hospital, he had treated children with lead poisoning caused by paint ingestion. He was joined by EIS officer Steve G. Gehlbach (EIS 1970), a close friend and also a pediatrician from Boston.

The two doctors first reviewed the county's data on environmental contamination. They found high levels of lead in air, soil and dust. Then they visited nearby child care centers to take blood samples. Their initial studies revealed that 60 percent of the children 10 years or younger living within one mile of the smelter had lead poisoning, with blood lead levels greater than 40 micrograms. "The norm for this level of lead absorption for the entire U.S. population was about 5-10 percent, so this was a very abnormal situation," says Landrigan, who decided to remain with the CDC to finish the research he had begun.

He extended his EIS service another year and returned to El Paso in the summer of 1972 to lead an investigative team of 10 EIS officers. Their research, which was published in The New England Journal of Medicine in 1975, concluded that lead emissions from the smelter were a key source of lead poisoning in children in the community. They found that the children had absorbed lead by inhaling it from the air and by ingesting it through hand-to-mouth contact from dust and soil, which explained why younger children tended to have much higher levels of absorption compared to older children. Further studies revealed that the children with the higher lead exposure had lower IQs and had problems with their behavior and reaction time compared to children from the same community with lower lead levels.

"This research and similar research elsewhere showed that there is a spectrum of lead toxicity. At the high end, coma and convulsions resulted, but at the lower levels, there is still damage to the brain, which shows up as loss of IQ, slowing of reaction time, hyperactivity, short attention span and inability to concentrate on a task," notes Landrigan. "This more subtle, but very real damage has come to be known as subclinical lead poisoning."

"The work we did in El Paso and the work that other people did around the country made us all realize that chemicals like lead could be toxic to children at levels previously thought to be safe. We came to realize that a large number of chemicals, including polychlorinated biphenyls (PCB's), methyl mercury and certain pesticides could all cause injury to children's developing brains."

Landrigan and his team went on to tour 20 different smelters around the United States, taking blood samples from children to document their toxicity exposure. In one lead smelter in Kellogg, Idaho, they found that a staggering 98 percent of children living within a mile of the smelter had lead poisoning.

"Our lead toxicity research definitely raised public consciousness about environmental hazards and resulted in a lot of favorable changes in public health policy," Landrigan notes. "One very important consequence of our work was the U.S. government's decision in 1976 to take lead out of gasoline. The lead was phased out over a period of many years. As a result of that decision, there has been a 90 percent reduction in blood lead levels in American children."

In the 1970's, Landrigan and a small group of EIS officers established the Environmental Hazards Activity, today known as CDC's National Center for Environmental Health. Its mission is to study outbreaks of disease caused by exposure to chemicals in the environment. The co-founders included Landrigan, Ed Baker, Malcolm Harrington and Dale Morse, all EIS alumni.

"A lot of energy went into the lead smelter work. We also got involved in studies of pesticide poisoning, toxic chemical spills and cases of contaminated ground water," says Landrigan.

Landrigan continued to work for CDC until 1985 when he left to lead the Department of Community and Preventive Medicine at Mount Sinai School of Medicine in New York, which boasts such prestigious alumni as current CDC Director Jeffrey P. Koplan, and CDC's chief epidemiologist Stephen Thacker. He currently is working with CDC, the EPA, NIH and the Surgeon General's Office to organize an ambitious, multi-year prospective

epidemiological study of 100,000 American children. The study, similar in scope to the Framingham, Massachusetts study of adults after World War II that helped document the risk factors of heart disease, will trace the long-term impact of children's health and development from early exposure to chemical toxins.

Landrigan credits his early work at the El Paso smelter with his decision to devote his public health career to the study of chemical pollutants on children's health.

"I continue to believe that the EIS represents a wonderful gateway into a career in public health. A high proportion of people who go into the EIS stay in public health."

Thanks to the landmark investigative work of Landrigan and his EIS colleagues, Americans are more aware of the insidious threat lead and other toxins pose to the most vulnerable segment of the population – children.

EIS PROFILE

Nicholas Wright

Years in EIS: 1964-1966

Age: 65

Hometown: Long Island, NY

1960



Assignment: Worked at a postpartum family planning clinic at Grady Memorial Hospital in Atlanta, serving as one of the early contributors to CDC's family planning program.

Education: Williams College (B.A., 1957); New York University School of Medicine (M.D., 1961); University of Michigan School of Public Health (M.P.H. – Population Planning).

Where He Is Today: Wright lives in Williamstown, Mass., where he continues to serve as a consultant for various international development and human rights organizations, runs an oriental rug business, and hopes to contribute to the pre-med program at Williams College.

Civil Rights in Health

For Nicholas Wright, the 1960's represents the birth of civil rights in health as well as the coming of age of the civil rights movement.

"There was a real concern that poor women in the South had not had access to maternal and child health and family planning services. The issue was how to get these services to people in the Southeast, where there weren't enough doctors. Fortunately, there were tremendous public health nurses in most of the rural counties who ran things in very creative and humanistic ways. I was always tremendously impressed meeting and working with these women."

From 1964 to 1966, Wright was an EIS officer at Grady Memorial Hospital in Atlanta, working in a postpartum family planning clinic which used specially trained nurses to give informal classes on family planning as an integral part of the postpartum visit. The program was managed out of Emory's obstetrics-gynecology department, which had received a grant in 1962, initially to provide free spermicidal foam and later, a new plastic 'Lippes loop' IUD for mothers who wished to space the births of their children and/or to limit their family size.

"At that time, oral contraceptives were not widely available and they were too expensive," recalls Wright. "There was tremendous demand for the IUD because it was more affordable and convenient. It was hard to keep up with the demand."

From the beginning, Wright's EIS assignment gave him the opportunity to contribute to a growing public health imperative, the provision of family planning within maternal and child health services as well as an integral part of postpartum care. At the same time, he was exposed to the country's struggle with extreme poverty – something Wright had not seen while growing up in Long Island. It was also during this period that, at the age of 28, Wright saw overt racism for the first time, in the form of separate drinking fountains and separate doctor-office entrances and waiting rooms for blacks and whites. Back then, Georgia was a much more rural state, with relatively few doctors to meet the needs of the population, particularly the poor.

Wright remembers one nurse well – Hazel Hutcheson from the Georgia State Health Department – who accompanied him on a road trip to a tiny county south of Macon to train a young doctor in IUD-insertion and clinical gynecology at the public health clinic. "Late in the day, just after we finished training the doctor, and he had left, Ms. Hutcheson and the county public health nurse told me that about 20 more women had suddenly appeared and were waiting hopefully outside the door. Word that family planning services were available got out very quickly in those communities," Wright recalls. "Though these communities were very conservative, the women trusted the public health nurses to advise them correctly on how they could have more control over their fertility."

While Wright and his colleagues did some early studies on pelvic infection, the overwhelming need was to service Grady's large postpartum population. Wright, with help from several dedicated nurses, volunteer gynecologists, and pediatric resident Bob Hatcher, EIS '66, who later would lead the much expanded, more comprehensive Emory University Family Planning Program, began to meet the exploding demand of women to gain the means to control their reproduction.

Grady soon became a model of family planning activities, and the Maternal Child Health division of the Georgia Health Department began to develop family-planning activities in each of the state's 159 counties. Wright visited at least 50 of these public clinics in 1965-66 to train physicians and nurses in clinical family planning skills. Following his EIS service, Wright accepted a position with the Population Council and later served as resident advisor in family planning to the governments of Sri Lanka and Thailand.

Wright was one of the early contributors to what became the CDC Family Planning Activity, originally envisioned by Alexander D. Langmuir, M.D., M.P.H. and carried out by Carl Tyler, EIS '66. Under Tyler's leadership, CDC led the way in domestic epidemiologic research on many family planning issues, and later became active in international family planning and population work. Findings from authoritative research done by EIS officers was useful in Wright's technical assistance activities in Asia and elsewhere.

"We've made tremendous progress in providing well-tested, effective, and safe family planning methods to women and men around the world. Birth rates have declined in countries where almost no one anticipated success in the 1960's," Wright says. "With the right organization and planning, family planning can quickly become the norm, even at relatively low levels of economic development. And simply with better spacing of children and fewer births per woman, there have been significant reductions in maternal, infant, and child death and disease."

Wright, who currently lives in Williamstown, Massachusetts, continues to consult for various international development and human rights organizations, runs an oriental rug business, and hopes to contribute to the pre-med program at Williams College. "In addition to the traditional practice model, pre-med students need to be exposed to some of the new models of practice that are increasingly common. And all of these models will increasingly incorporate large doses of epidemiology and prevention. Fortunately, epidemiology is a good fit in a liberal arts curriculum."

"It's helpful to have a public health view, to understand prevention better, to emphasize prevention as well as treatment," Wright says. "CDC has made prevention respectable

doing such high-quality research. It's critical that doctors appreciate this because they see individual people at points where a little advice or counseling can sensitize them to protect themselves from illness later. Prevention belongs to clinicians as surely as it does to public health practitioners. Family planning is part of that story."

EIS PROFILE

Neal Nathanson

Years in EIS: 1955-1957

Age: 73

Hometown: Boston

1950



Assignment: Served as chief of newly formed Polio Surveillance Unit from 1955-1957 and was involved in investigating the cause of a polio outbreak in 1955. Isolated the cause to two lots of vaccine from a particular manufacturer, helping to restore public confidence in the vaccine during a critical period in its early history.

Education: Harvard College (B.A., 1949); Harvard Medical School (M.D., 1953).

Where He Is Today: A resident of Philadelphia, Nathanson currently serves as vice provost for research at the University of Pennsylvania Medical School. He recently completed two and a half years as director of the Office of AIDS Research at NIH, where he is credited with bringing a public health perspective to the organization.

Disease Detectives Called in to Solve Polio Scare

Almost five decades have passed since the nationwide testing of the Salk polio vaccine. The largest medical experiment in history, its legacy is seen in current efforts to eradicate the world of this infectious viral disease that causes permanent paralysis. It was just five decades ago that parents in the U.S. were afraid to allow their children to go to a swimming pool or sandbox for fear the virus would confine them to a wheelchair.

Neal Nathanson, a medical resident from the University of Chicago and newly named EIS officer in 1955, vividly recalls the time. "The trial went from the spring of 1954 to the fall of that year. It wasn't until April 1955 that all the data were analyzed, which concluded that the Salk vaccine was 60 to 90 percent effective."

Five selected manufacturers, including the Cutter Laboratory in California, had already prepared the vaccine for widespread use in anticipation of a successful field trial. The FDA approved the vaccine, and children across the nation soon eagerly lined up to receive the vaccine in the spring of 1955. By the end of April, public euphoria over the vaccine's effectiveness came to a crashing halt when several cases of child paralysis occurred, causing a public panic and raising doubts over the vaccine's safety. On May 8, the U.S. Surgeon General suspended the entire U.S. vaccine program pending inspection of each manufacturer's production plant.

"People began to question that if this product was unsafe, how do we know that every other vaccine is safe? The credibility of the Public Health Service was also on the line," recalls Nathanson. It was essential to solve the polio cases before parents lost faith in the vaccines that protected their children from DTP (diphtheria, tetanus, pertussis) and other devastating diseases.

Overnight, CDC's chief epidemiologist, Alexander D. Langmuir, M.D., M.P.H., set up the Polio Surveillance Unit to investigate the outbreak. He staffed the unit with a secretary and two EIS officers including Nathanson, one of the few EIS officers never to have

taken a formal EIS training course. Instead, he received on-the-job mentoring in the science of epidemiology from Dr. Langmuir himself.

The surveillance unit began gathering data from state health departments around the country, which received reports from local health departments on every case of polio reported. There was very little 'natural' polio occurring during that time of the year.

The public was anxious for information so CDC issued daily reports of its investigation. The New York Times printed the reports on its front page for a month, underscoring the national attention which the outbreak received.

"It became clear that these cases were associated with a couple of states – California and Idaho. Further investigation revealed that the source was from two lots of vaccine from a single manufacturer – the Cutter lab," Nathanson recalls.

With the cause of the outbreak isolated by the EIS, the FDA quickly lifted its moratorium on the vaccine with the other manufacturers beginning on May 13.

The CDC reviewed 260 polio cases, including 94 recipients of the Cutter vaccine, 126 family members who were infected from close contact with the children, and another 40 community contacts.

The quick work of the EIS under Dr. Langmuir's direction helped allay fears, rescue the vaccine program, and restore public confidence in the vaccine and the U.S. Public Health Service. At the same time, the outbreak pointed to the need for a national disease surveillance capability. Today, CDC works with its partners to conduct surveillance for hundreds of diseases and conditions, such as AIDS, Lyme disease, lead poisoning, tobacco use, work-related injuries, birth defects and cancer.

The EIS' findings also led the federal government to establish more stringent standards for manufacturing vaccines and for testing the safety of products in general. Specifically, before a vaccine is licensed, manufacturers must provide a full production history and a consistent positive outcome on product safety testing.

The U.S. has not seen a new case of polio since 1979. Thanks to a global eradication effort spearheaded by CDC, the World Health Organization, Rotary International, and UNICEF, polio is limited to just 20 countries and is due to be eradicated by 2002.

"I feel very lucky – it was happenstance that I was drawn into this," says Nathanson of his EIS work with the Polio Surveillance Unit. Nathanson went on to serve as head of infectious diseases at Johns Hopkins Medical School, and in 1995 he retired from the University of Pennsylvania Medical Center after 17 years. Nathanson also just finished two and a half years as director of the Office of AIDS Research at NIH, where he is credited with "bringing a public health perspective to the organization."

While the Salk vaccine is well-regarded as the first step toward the elimination of polio, the pioneering investigative work of the EIS and the Polio Surveillance Unit ensured the vaccine's survival at a critical point in its young history. At the same time, the work of Dr. Langmuir, Nathanson and others fueled the creation of a nationwide disease surveillance capability by the CDC that continues to flourish today.